

2.3 - Focus of a Parabola

1 of 16

Warmup - Find the vertex, the value p , and the direction the parabola opens.

1. $y = \frac{1}{8}x^2$

V (0, 0)
 $p = 2$
opens up

2. $x = -\frac{1}{12}y^2$

V (0, 0)
 $p = 3$
opens left

3. $x = -(y - 2)^2$

V (0, 2)
 $p = 1/4$
opens left

4. $y = (x + 5)^2$

V (-5, 0)
 $p = 1/4$
opens up

5. $x + 3 = \frac{1}{4}(y - 1)^2$

V (-3, 1)
 $p = 1$
opens right

6. $y + 4 = -\frac{1}{36}(x - 4)^2$

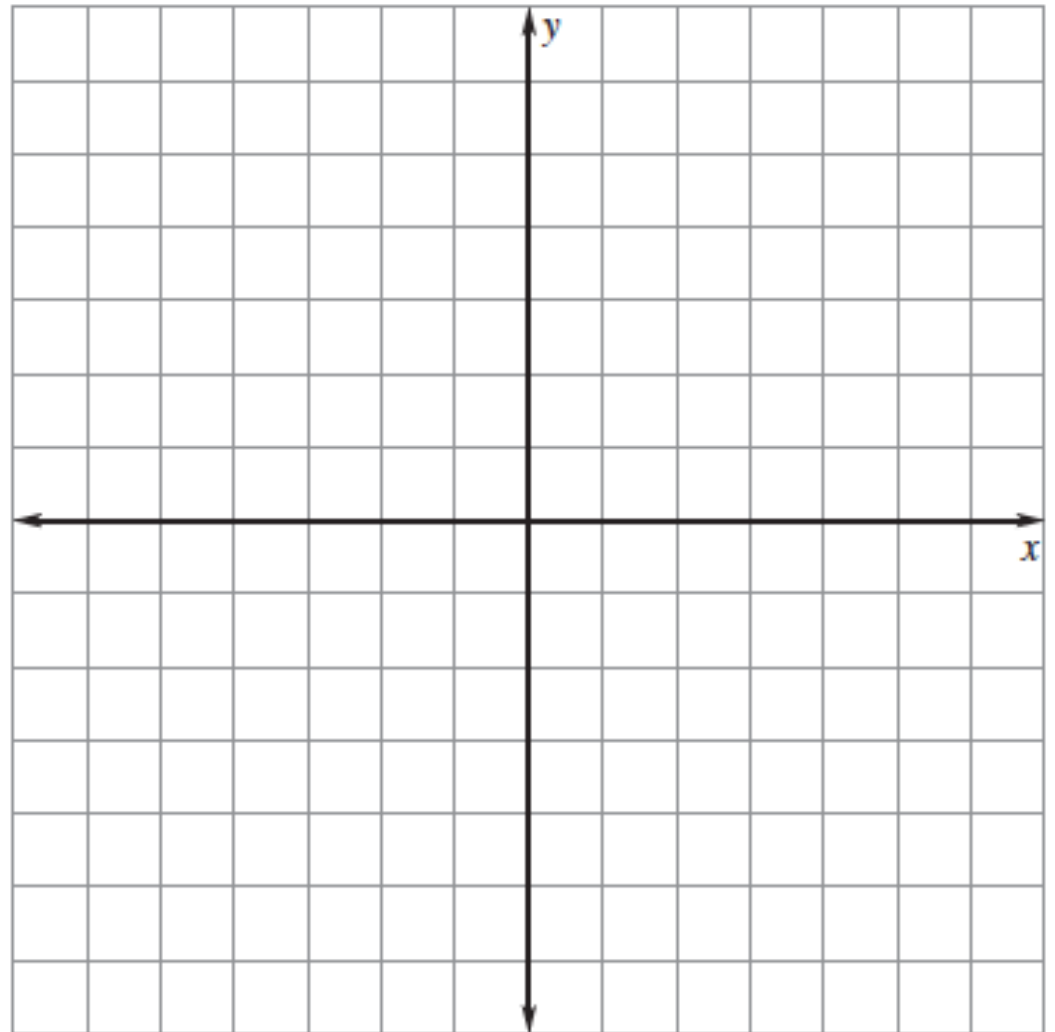
V (4, -4)
 $p = 9$
opens down

2.2 - Characteristics of Quadratic Functions

2 of 16

Graph the function $f(x) = 0.5(x + 4)^2 - 2$

Label the vertex,
axis of symmetry,
focus, and directrix.



2.2 - Characteristics of Quadratic Functions

3 of 16

Graph the function $f(x) = 0.5(x + 4)^2 - 2$

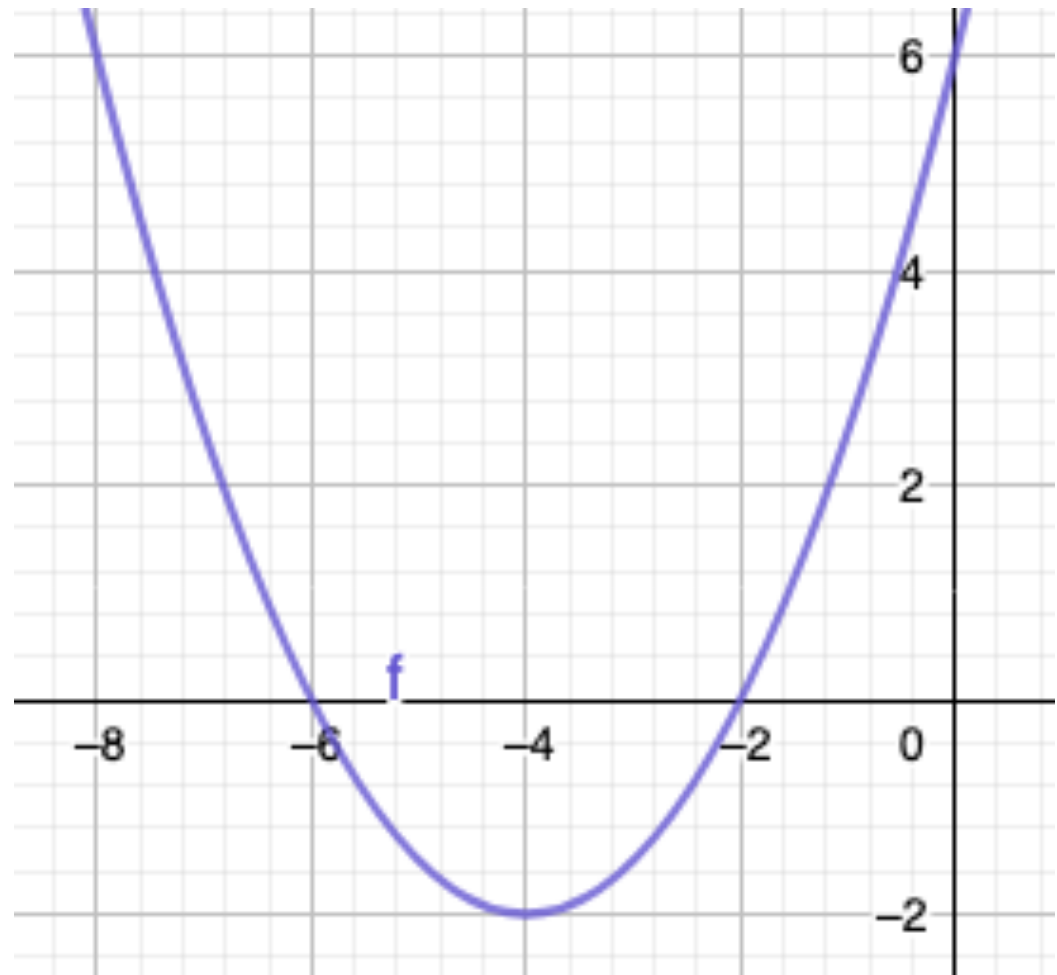
Label the vertex,
axis of symmetry,
focus, and directrix.

$$V : (-4, -2)$$

$$AOS : x = -4$$

$$F : \left(-4, -\frac{3}{2}\right)$$

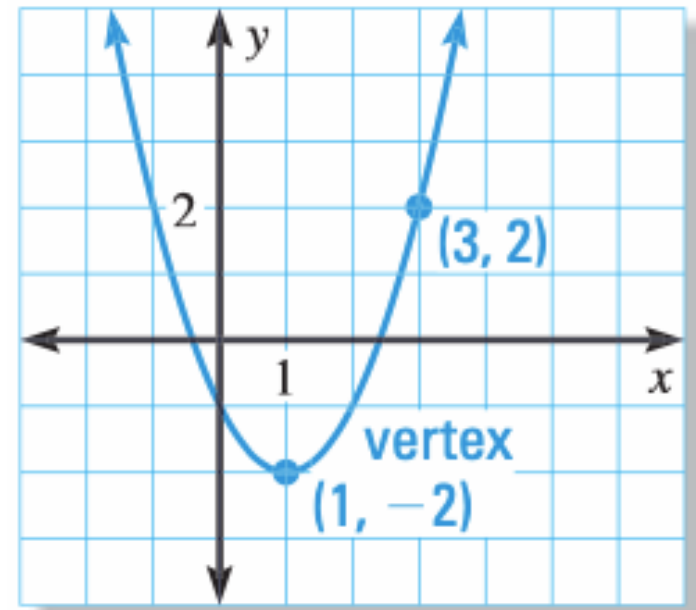
$$D : y = -\frac{5}{2}$$



2.2 - Characteristics of Quadratic Functions

4 of 16

Write a quadratic function



$$f(x) = (x - 1)^2 - 2$$

2.2 - Characteristics of Quadratic Functions

5 of 16

Practice - Write a quadratic function

1. Vertex (4, -5)
passes through (2, -1)

$$y = (x - 4)^2 - 5$$

2. Vertex (-3, 1)
passes through (0, -8)

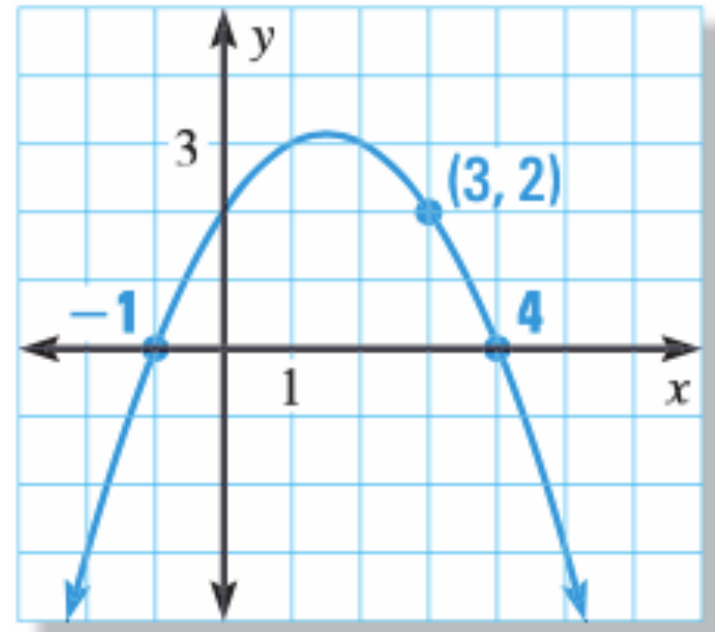
$$y = -(x + 3)^2 + 1$$

2.2 - Characteristics of Quadratic Functions

6 of 16

Write a quadratic function

$$y = a(x - p)(x - q)$$



$$f(x) = -\frac{1}{2}(x + 1)(x - 4)$$

2.2 - Characteristics of Quadratic Functions

7 of 16

Practice - Write a quadratic function

23. x -intercepts: 3, 7
point: (6, -9)

24. x -intercepts: -5, -1
point: (-7, -24)

2.2 - Characteristics of Quadratic Functions

8 of 16

Write a quadratic function for the parabola that goes through points $(-1, -3)$, $(0, -4)$, and $(2, 6)$.

$$f(x) = 2x^2 + x - 4$$

$$V \left(-\frac{1}{4}, -\frac{33}{8} \right)$$

2.2 - Characteristics of Quadratic Functions

9 of 16

Practice - Write a quadratic function

4. $(-1, 5), (0, -1), (2, 11)$

5. $(-2, -1), (0, 3), (4, 1)$

2.3 - Focus of a Parabola

10 of 16

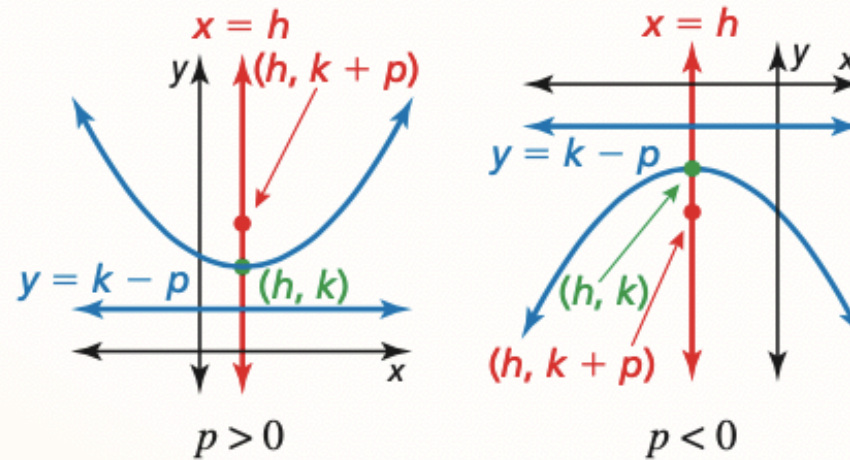
Standard Equations of a Parabola with Vertex at (h, k)

Vertical axis of symmetry ($x = h$)

Equation: $y = \frac{1}{4p}(x - h)^2 + k$

Focus: $(h, k + p)$

Directrix: $y = k - p$

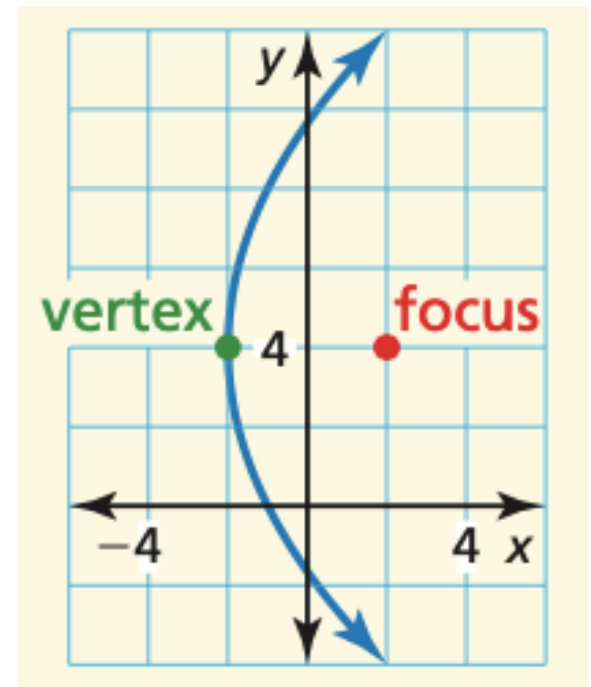


2.3 - Focus of a Parabola

11 of 16

Write an equation of the parabola shown.

$$x = \frac{1}{4p}(y - k)^2 + h$$



$$x = \frac{1}{16}(y - 4)^2 - 2$$

2.3 - Focus of a Parabola

12 of 16

Practice - Write an equation of the parabola with vertex (0,0).

5. directrix: $x = -3$

$$x = \frac{1}{12}y^2$$

6. focus: $(-2, 0)$

$$x = -\frac{1}{8}y^2$$

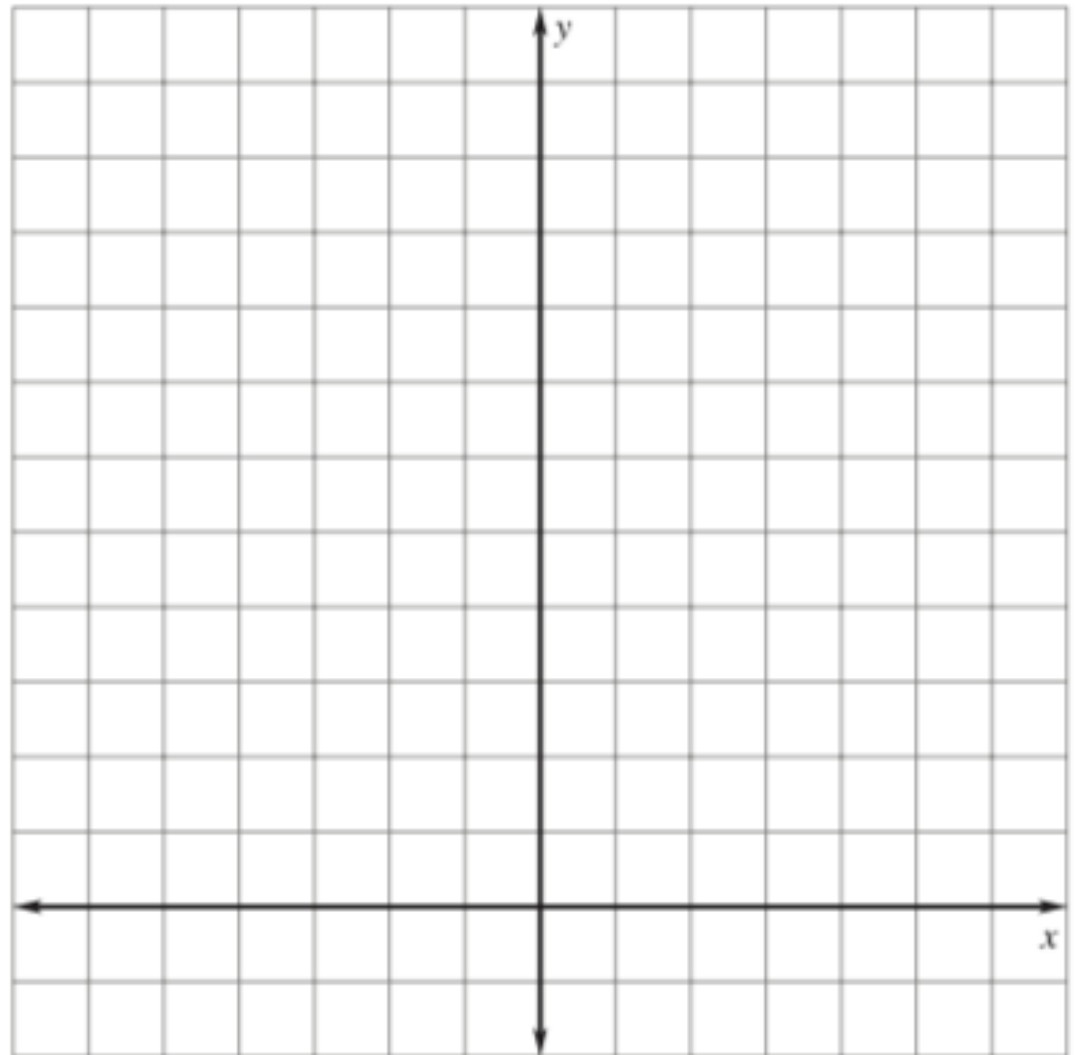
7. focus: $(0, \frac{3}{2})$

$$y = \frac{1}{6}x^2$$

2.3 - Focus of a Parabola

13 of 16

Find the focus, directrix, vertex, and graph the parabola. $x^2 - 2x - 8y - 7 = 0$

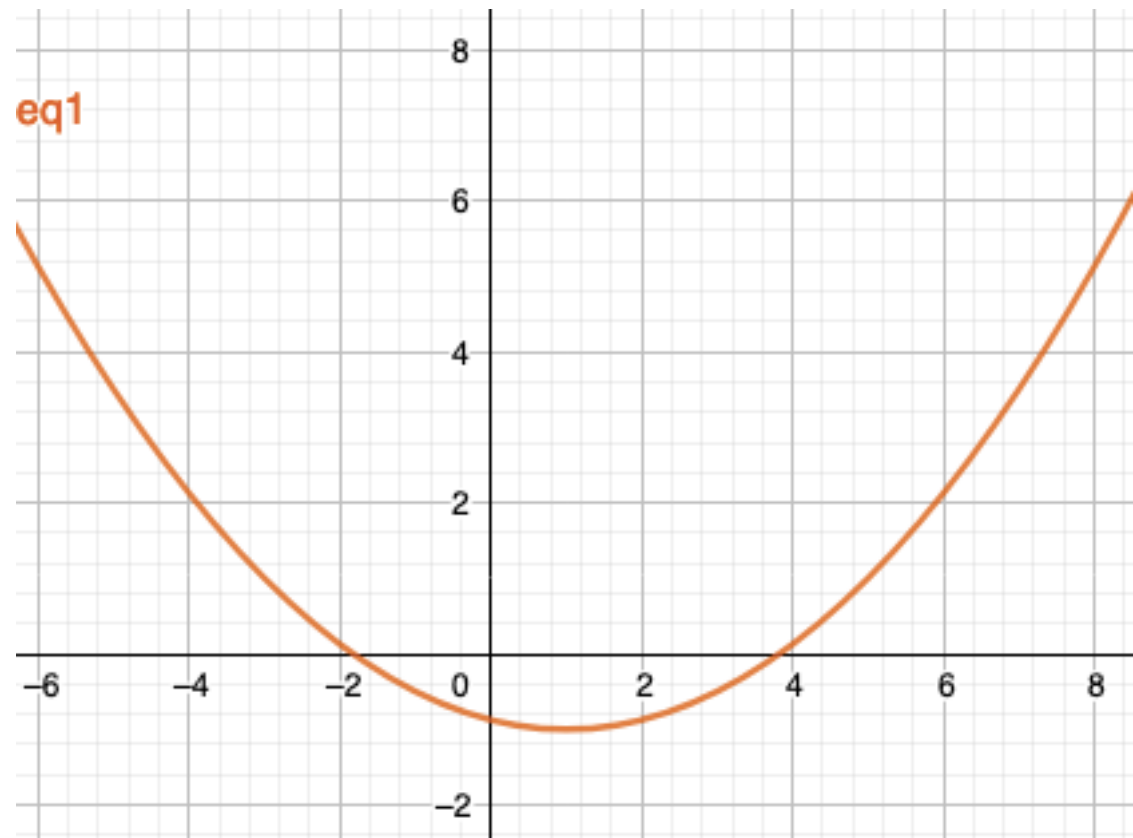


2.3 - Focus of a Parabola

14 of 16

Find the focus, directrix, vertex, and graph the parabola. $x^2 - 2x - 8y - 7 = 0$

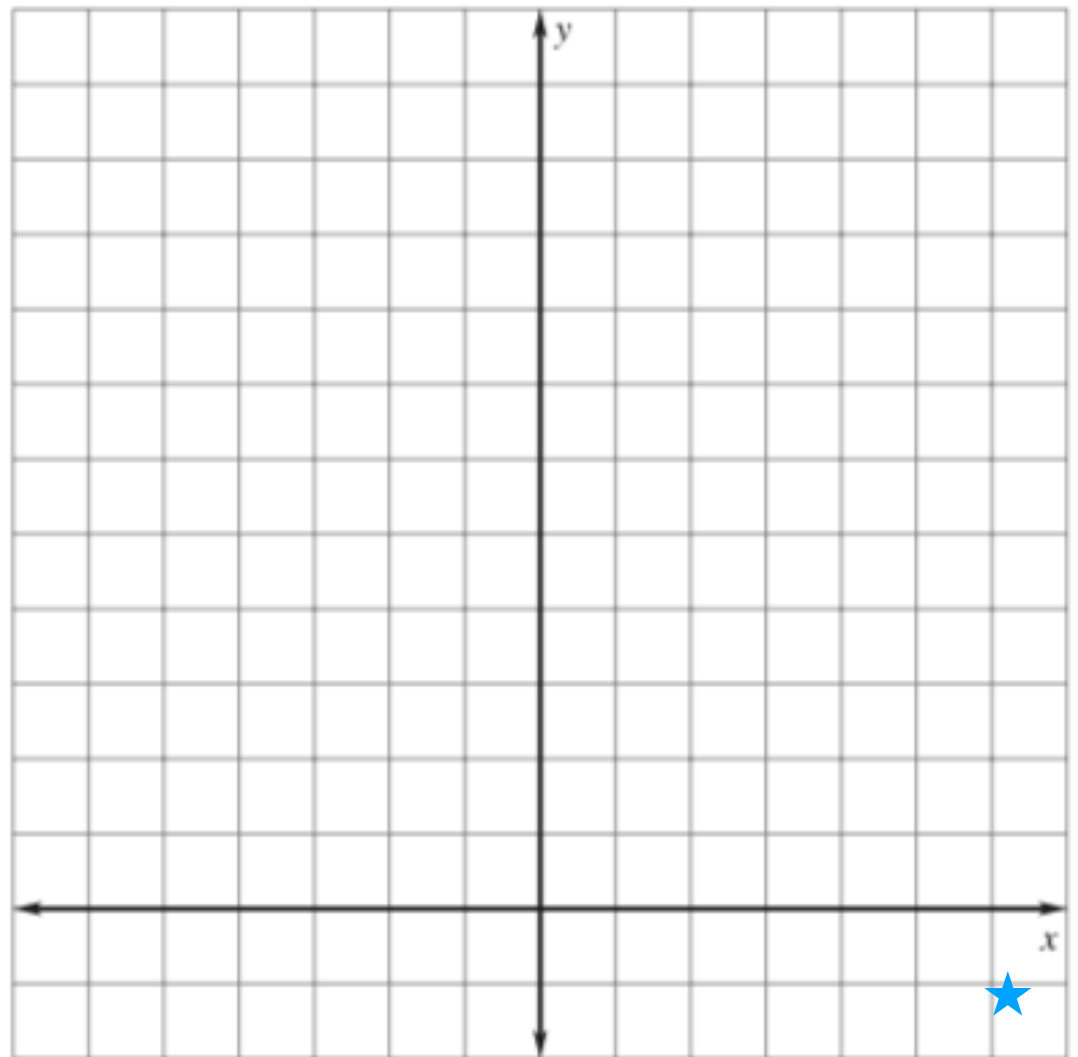
$p = 2$
 $V(1, -1)$
 $F(1, 1)$
 $D: y = -2$



2.3 - Focus of a Parabola

15 of 16

Find the focus, directrix, vertex, and graph the parabola. $8y - x^2 + 6x - 41 = 0$



2.3 - Focus of a Parabola

16 of 16

Find the focus, directrix, vertex, and graph the parabola. $8y - x^2 + 6x - 41 = 0$

$$\begin{aligned}p &= 2 \\V &(3, 4) \\F &(3, 6) \\D: y &= 2\end{aligned}$$

